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JACK SHAFT GARAGE DOOR OPERATOR

BACKGROUND OF THE INVENTION

The invention relates in general to garage door operators and in particular to a jack shaft garage door operator having a pivoting arm for preventing cable associated with a pull-up cable drum from becoming slack during the operation of the door and for providing a positive door locking system.

One of the problems associated with jack shaft garage door operators is that while they are compact and may be conveniently used in garages which have little overhead room, they may present problems to the owners of the garage in that the cable may be payed out allowing the door to close under its own weight and if the door stalls or if the cable pay out drum rotates too far, the tension in the cable will drop and the cable may come off the drum necessitating a visit from a repairman.

In addition, the jack shaft garage door operator does not provide any secure locking facility other than a lock at the bottom of the door, which may be tampered with by a burglar. If the door is not locked by some other means, the bottom locked may be forced or damaged and the door can be lifted open and the garage entered by an intruder.

U.S. Patent No. 3,785,809 discloses a door operator having a winch member built into a tilting door and movable with it. A cable is attached to a wall member supporting the door and another end of the cable is connected to an extensible arm.

U.S. Patent No. 2,185,828 discloses a catch for stopping a door from falling in the event that a sustaining cable or a counterbalance fails or breaks.

U.S. Patent No. 4,385,471 discloses a door including a stopping member having a clip connection which engages a cable. If the cable breaks, as shown in

FIG. 4, the arm 27 rotates outwardly bringing a cam dog 26 having a plurality of teeth 32 into locking engagement with a roller 13a to prevent the roller 13a from moving, thereby suspending the door in position.

5 U.S. Patent No. 4,520,591 to Calvagno discloses a system that is mechanically responsive to a break in a cable to prevent a door from falling.

French Patent No. 2634-815-A includes an "anti-drop" safety mechanism having a cam plate 21 on either side
10 of the door equipped with a convex toothed edge to engage a bracket in case of door suspension failure. None of the aforementioned documents teach or disclose solutions for preventing a door from being opened or from stopping an operation of a garage door operator to cause it to reverse
15 to take up cable which may have inadvertently been payed off a cable drum of a jack shaft door operator.

What is needed then is an improved jack shaft garage door operator that avoids unwanted problems with the cable coming off the drum and provides security for the
20 user.

SUMMARY OF THE INVENTION

A jack shaft garage door operator is useful for opening a closing a movable garage door. The jack shaft garage door operator embodying the present invention
25 includes a drive unit having an electric motor therein for driving a jack shaft. The jack shaft is mounted above a door opening and usually has coupled to it a spring, or the like, for providing a restoring force to the jack shaft to help raise the door and to support a portion of the weight
30 of the door that is not supported by the L-shaped rails that a door usually rides in. A pull-up cable drum is connected to the jack shaft to be rotated thereby and has a multi-strand steel pull-up cable connected thereto that may be payed out to lower a door or wound up to raise the

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door. The pull-up cable is typically connected to a bottom portion of the door and, when wound up, will cause the door to rise along vertical portions of L-shaped rails. A pivotable arm is mounted on the garage near the jack shaft and includes an arm extension having a rounded surface which may be a roller or may be fixed for engaging the multi-strand steel pull-up cable. The pivotable arm, including the cable engaging portion, is biased by a spring causing the cable engaging portion to maintain the cable under tension in the drum. In the event that the cable is inadvertently payed out, for instance, by the door having reached the bottom of its travel and the operator continuing to run, the pull-up arm is allowed to pivot upwardly by reduced tension in the cable and swings far enough upward that an operator arresting dog comes in contact with a toothed wheel mounted upon the jack shaft causing the garage door operator to stall. The garage door operator is otherwise a conventional garage door operator and when ⁱⁿ ~~in~~ a stalled condition, automatically reverses, causing the cable to be payed in and the door to be opened. Thus, the pivotable arm prevents the cable from coming off the cable drum. In addition, a stop or means for preventing the garage door from opening in the form of a metal plate is bolted on an upper panel of the garage door and, when in the closed position, is immediately beneath the pivoting arm of the cable when it is pulled downwardly by full tension on the cable. If the door is attempted to be breached, for instance by an intruder attempting to lift the door, the cable becomes slack allowing the pivoting arm to come out slightly so that it then engages compressional-ly the stop plate on the garage door thereby preventing further upward motion of the garage door.

It is a principal aspect of the present invention to provide a jack shaft garage door operator having a mechanical cable tension sensor for providing door reversal before a cable pays off a cable drum.

It is another aspect of the present invention to provide a jack shaft garage door operator having a door opening block adapted to engage a pivoting arm to prevent a door from being forced open.

5 Other advantages of the invention will become obvious to one of ordinary skill in the art upon a perusal of the following specification and claims in light of the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

10 FIG. 1 is an elevational view of a portion of a garage having a garage door in a closed position with a jack shaft garage door operator associated therewith and embodying the present invention;

15 FIG. 2 is an enlarged isometric view having portions broken away to show details of a portion of the jack shaft garage door operator shown in FIG. 1;

FIG. 3 is a side elevational view of a portion of the jack shaft garage door operator shown in FIGS. 1 and 2 with the garage door positioned in a closed position; and

20 FIG. 4 is a side elevational view, partially in section, showing a cable tensioning member of the jack shaft garage door operator positioned to take up slack in a pull-up cable.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

25 Referring now to the drawings and especially to FIG. 1, a jack shaft garage door operator embodying the present invention and generally identified by numeral 10 is shown therein. The jack shaft garage door operator 10 is mounted on a garage 12 near a garage door opening 14 which
30 has associated with it a movable multiple panel garage door 16.

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The jack shaft garage door operator 10 includes a drive unit 20 having a jack shaft 22 coupled thereto to be turned thereby. A pull-up cable unit 24 is mounted on the jack shaft 22 to be turned and a pull-up cable 26 is wound around the cable drum 24 to be pulled upwardly. A pivotable arm ^{assembly} 28 is mounted on a header 30 of the garage 12 immediately above the door opening 14 adjacent the jack shaft 22 and includes a cylindrical cable engaging member or cable tensioner arm 34 for engaging the pull-up cable 26 and ending in a cable retaining knob 35 for preventing the pull-up cable 26 from sliding off the tensioner arm 34. A door lock bracket or means ³⁶ for preventing the garage door from opening ~~36~~ is mounted on the garage door 16.

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More particularly, the garage door 16 is a multiple paneled door consisting of a plurality of rectangular panels 40, 42, 44 and 46. The panels 40 and 42 are connected by a plurality of hinges 50. Panels 42 and 44 are connected by a plurality of hinges 52. Panels 44 and 46 are connected by a plurality of hinges 54. The door is carried on a pair of rollers in a pair of L-shaped tracks, details of one of which are shown in FIGS. 2 through 4. The exemplary L-shaped track 60 shown in FIG. 2 includes a vertical portion 62, a curved portion 64 and a horizontal portion 66. Rollers 70 and 72 positioned on respective shafts 74 and 76 mounted to the door panel 46 ride in the track 60 and carry the door panel upwardly and downwardly. In operation, when the door 16 is lowered, the jack shaft 22 is rotated to pay out the cables 26 and 27 from the pull-up cable drums 24 and 25.

30 The pivoting arm assembly 28 includes a base plate assembly 80 mounted on the header 30 and a pivot 82 which supports a pivotable arm 84. The pivotable arm 84 includes a bracket-type stop member 86 having wall portions 88 and 90 supporting a cross bar 92. The pivoting arm 28 35 includes a bottom wall 96 and a pair of sidewalls 98 and 100 for providing strength thereto, in particular, com-

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pressional strength. The arm 84 is biased outwardly and upwardly by a spring 104 and is normally held in a substantially vertical position as shown in FIG. 3 by tension in cable 26 when only a sufficient amount of cable 26 has been payed out so that the door is either partially supported by cable 26 or has been closed without additional cable 26 having been payed out. In the event that, for whatever reason, the drum 24 continues to turn, additional cable 26 is payed out and the arm 84 tends to pivot upwardly until it reaches a substantially horizontal position as shown in FIG. 4. At that point the cross bar 92 engages a shaft lock hub comprising a toothed wheel 120 having a plurality of detents or teeth 122, 124, 126, 128, 130 and 132 formed thereon and thereby prevents further turning of the jack shaft 22, stalling the drive unit 20 which causes the drive unit 20 to automatically reverse, pulling the cable 26 back in and swinging the arm away from the cog wheel 120. In addition, it should be noted that the cog wheel 120 has asymmetric cogs with perpendicular edges as exemplified by cog 120 with perpendicular edge 136 and sloping edge 138 allowing the jack shaft 22 to rotate upwardly despite the cross-bar 92 being in engagement with the teeth 120 while preventing downward rotation.

In addition, if the drive unit 20 is stopped and the door 16 is attempted to be opened, in other words it is forced upward as shown in FIG. 2, the cable 26 becomes slack allowing the cable arm to pivot outwardly, as shown in FIG. 2, sufficiently so that it engages the stop 36, more specifically a stop lip 150 thereof. The stop 36 also includes a base wall 152 and a pair of sidewalls 154 and 156 for providing strength so that the stop lip 150 is not deformed by being brought into compressional engagement with the movable arm 84. In addition, since the movable arm 84 is substantially trough shaped with sidewalls 98 and 100 providing strength to the base wall 96, the com-

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pressional engagement will not tend to crush the arm and will prevent the door 16 from rising farther.

Thus, what has been provided is a mechanical device for providing security for a garage door by preventing the garage door from being inadvertently opened while also preventing cable from being accidentally payed off the drums 24 and 26 which would necessitate an expensive repair call.

While there has been illustrated and described a particular embodiment of the present invention, it will be appreciated that numerous changes and modifications will occur to those skilled in the art, and it is intended in the appended claims to cover all those changes and modifications which fall within the true spirit and scope of the present invention.

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